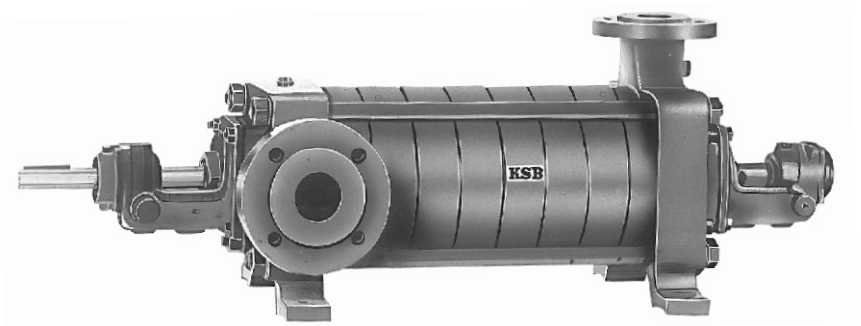
Operating and
Installation Manual
1754.8x/02-10G3

WKF

High-Pressure Centrifugal Pump



ISO-9001-2000 CERTIFIED

KSB

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General

Centrifugal pumps will give trouble-free, satisfactory service if they are properly installed and maintained.

Follow the instructions in this manual carefully. Do not run the pumps under operation conditions which may differ from those specified by us.

This manual does not take into account any site safety regulations which may apply. The site manager or site operator is responsible for notifying our erection staff of any such regulations and ensuring they are complied with.

The types series, pumps size, main operating data, product no. and serial no. are all stamped on the nameplate attached to the pump.

Please quote this information whenever you have queries or repeat orders and in particular when ordering spare parts.

⚠ **Do not operate this pumpset above the limit values for capacity, speed, pressure and temperature etc. shown on the nameplate.**

Ensure that operation is in accordance with the instructions contained in this manual (contract documentation). It is essential that the electrical connection values are as specified and that the instructions on installtion and maintenance are followed.

Failure to do so can result in personal injury and damage to equipment.

N.B.

The instructions and descriptions in this manual refer to the standard pump model. This manual does not cover all design details or eventualities which might occur during installation, operation or maintenance. The pumpset must only be handled by skilled, trained personnel.

For any information and instructions not contained in this manual, please contact KSB.

The manufacturer accepts no liability for the pumpset if the instructions in this manual are not complied with.

0.1 Handling

When handling the complete pumset attach ropes to the pump and motor as shown (not through the motor eyebolt).

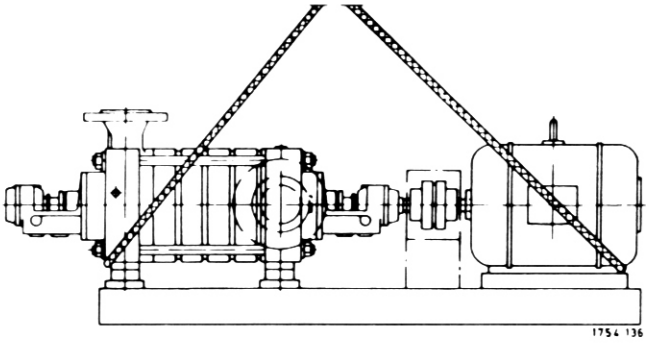


Fig. 1 Pump and motor on a common baseplate

1 Installation (Mounting / installation at side)

1.1 Foundation

Make sure that the concrete foundation has set hard before mounting the pumpset. The surface of the foundation must be completely level and perfectly smooth.

1.2 Mounting

Position the pumpset on the foundation and align using a precision spirit level (on the shaft/discharge nozzle). Ensure that the gap between the two coupling halves is as given on the general arrangement drawing. Shims should always be fitted to the left and right of the bolts in close proximity to the bolts, between the baseplate/baseframe and foundation. If the bolts are more than 800 mm apart, position extra shims equi distant between them. All shims must seat perfectly flush.

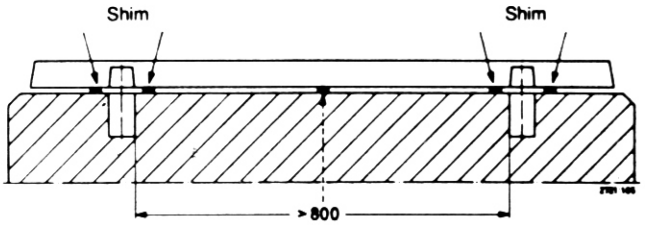


Fig. 2 Fitting Shims

Uniformly tighten up the bolts.

Grout in the baseplate (non-shrinking mortar is highly recommended), ensuring no cavities remain.

1.3 Aligning the Pump and Motor

After the baseplate has been fixed in position carefully check the coupling and if necessary, realign the pumset (at the motor).

Before doing so, loosen pump feet and tighten again free from loads.

The coupling must also be checked and the pumpset realigned even if the pump and motor are supplied ready mounted on a common baseplate.

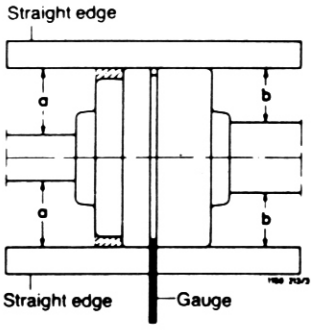


Fig. 3 Aligning a non-spacer type flexible coupling

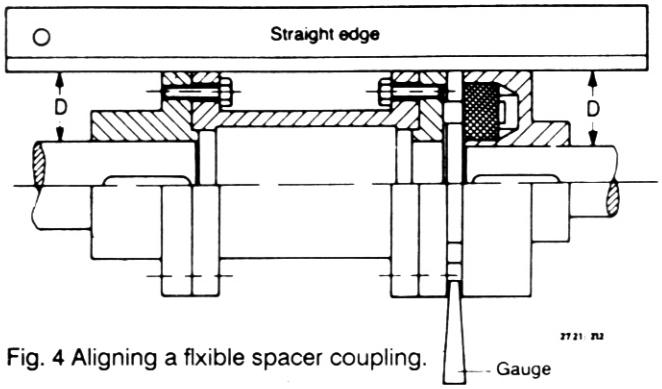


Fig. 4 Aligning a flxible spacer coupling.

The axial and radial deviation between the two coupling halves must not exceed 0, 1mm.

If the temperature of the product pumped is ≥ 100 °C, the pump must be pinned to the baseplate (see Fig. 5). Tighten foundation bolts at the discharge side pump feet slightly only to facilitate free thermal expansion.

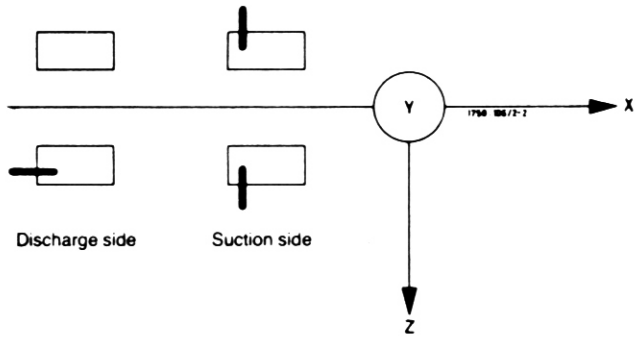


Fig. 5 Pinning the pump to the baseplate

1.4 Connecting the Piping

Never use the pump as an anchorage point for the piping. Forces and moments of the piping may act both on suction and discharge nozzles at the same time.

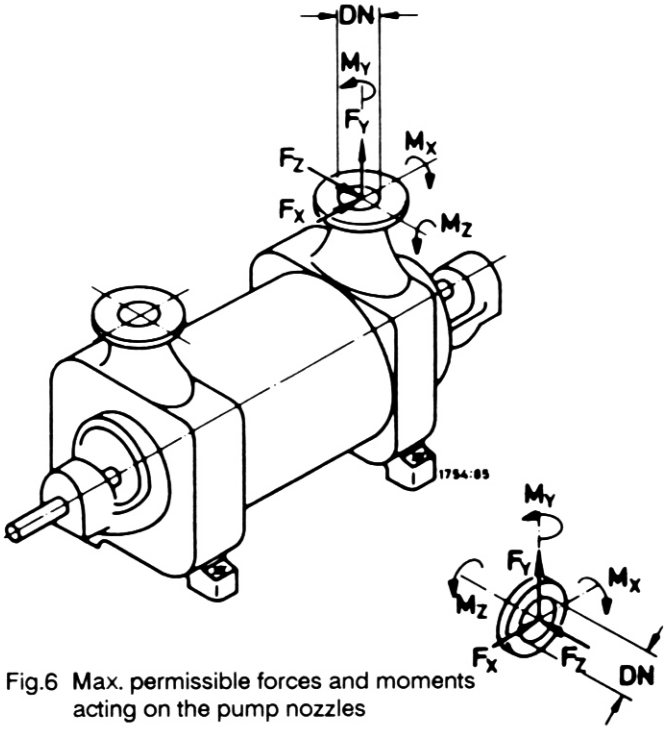


Fig.6 Max. permissible forces and moments acting on the pump nozzles

Directions in which the forces are acting:

X = horizontal, parallel to the pump axis
Y = vertical to the pump axis
Z = horizontal at right angles to the pump axis

Directions in which the moments are acting:

MX = around the horizontal axis, parallel to the pump axis
MY = around the vertical nozzle axis
MZ = around the horzontal axis at right angles to the pump axis
DN = nominal diameter of the suction and discharge nozzle

Dimensions:

F in N
M in Nm
DN in m

Suction and discharge nozzles have to be considered separately.

max permissible piping forces

WKF		100
Suction nozzle		
F_x		800
F_y	[N]	2000
F_z		800
M_x		700
M_y	[Nm]	500
M_z		700
Discharge nozzle		
F_x		800
F_y	[N]	2000
F_z		800
M_x		600
M_y	[Nm]	600
M_z		750

The suction line should be run with a rising slope towards the pump, under inflow conditions with a downward slope towards the pump.

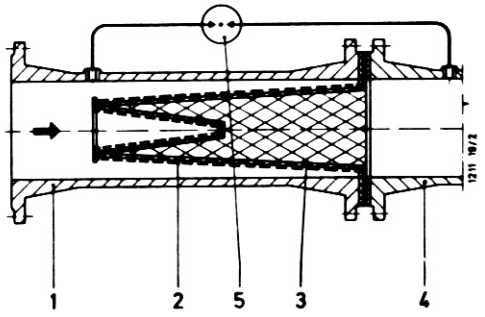
The pipes should be supported very near to the pump and should be connected to the pump without transmiting any stresses and strains to it. The pump must not bear the weight of the piping.

The nominal diameters of short pipe lines shall correspond at least to those of the pump connections; for long pipe lines the most economic nominal diameters shall be determined depending on the respective requirements.

We recommend installing non-return devices and shut-off valves, depending on the type of installation and pump.

The thermal expansion of the pipework should be accommodated by suitable means so as not to impose any extra load on the pump.

Before commissioning a new installation, thoroughly clean, flush and blow through all vessels, piping and connections. As welding beads, scale and other impurities frequently only become dislodged after a certain period of time, it is necessary to fit a strainer in the suction line to prevent these from entering the pump. The total cross-section of the holes in the strainer should be three times the cross-section of the piping in order to avoid excessive pressure loss across the strainer due to clogging. The conical strainer consists of a coarse strainer fronted by a fine strainer with a 2,0 mm mesh and 0,5 mm diameter wire, made of corrosion-resistant material, see DIN 4181.



1 Strainer holder
2 Fine strainer
3 Coarse strainer
4 Pump suction nozzle
5 Differential pressure gauge

Fig. 7 conical strainer for suction line

1.4.1 Auxiliary Connections

The size and location of all necessary auxiliary pump connections (circulation, balance, leakage, liquids) are shown in the installation plan or in the piping diagram.

Mind the diaphragm fitted in our works (Fig. 8) when disassembling or mounting.

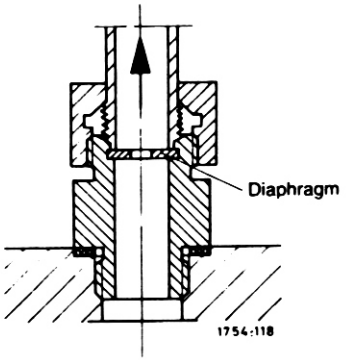


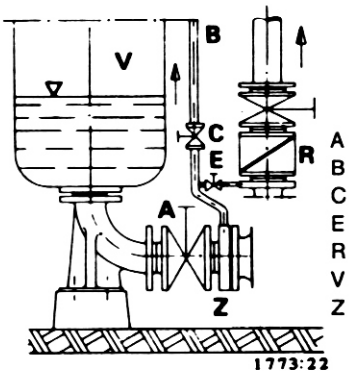
Fig. 8 Diaphragm in balance line

WKF	100
Diameter of diaphragm	5,5 mm

1.4.2 Vacuum Balance Line

If the pump has to pump liquid out of a vessel under vacuum it is advisable to fit a vacuum balance line. This line should have a minimum nominal diameter of 25 mm and should be arranged to lead into the vacuum vessel at a point above the highest permissible liquid level.

An additional line which can be closed - the discharge nozzle balance line - facilitates pump venting prior to start-up.



A Main shutt-off valve
B Vacuum balance line
C Shutt-off valve
E Vacuum-tight shut-off valve
R Non-return valve
V Vacuum vessel
Z Intermediate flange

Fig.9 Suction line and vacuum balance

1.4.3 Minimum Flow

If it is possible that the pump will have to operate against a closed shut-off valve arranged in the discharge line, a minimum flow of

t −10 to +100 °C ≈ 15 % of Q_{opt}
t> 100 to +140 °C ≈ 20 % of Q_{opt}
t> 140 to +200 °C ≈ 25 % of Q_{opt}

must be provided during that time.

If special cases require a detailed calculation, contact KSB.

1.5 Direction of Rotation

The rotational direction must correspond to the arrow on the pump. Check this by switching the pump on and then off again immediately.

Always check the direction of rotation with the motor disconnected.

1.6 Coupling Guard

Safety regulations specify that pump must be fitted with a coupling guard. If the purchaser stipulates that he does not want us to supply a guard then this must be provided by the operator.

1.7 Final Check

Re-check alignment as described in 1.3. It must be possible to rotate the coupling easily by hand.

Check if all connections are correct and function properly.

2 Start-up / Commissioning, Shutdown.

2.1 Preparations

2.1.1 Lubricants

Oil lubricated bearings

Fill the bearing bracket with HD 20 quality oil.

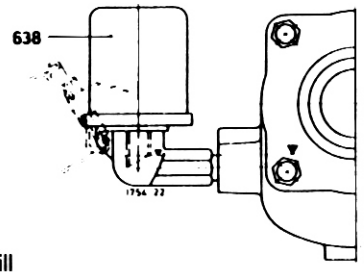


Fig.10 Oil fill

Procedure:

Pull out vent plug. Fill in oil through the hole left by the vent plug until oil appears in the vertical section of the elbow connecting bearing bracket and reservoir (Fig. 10). Then fill up the reservoir and snap it back into position. Fit vent plug. After a short time check whether the oil level in the reservoir has dropped. The reservoir must always be kept topped up.

2.1.2 Shaft Seal

Shaft seal (see4.4.2)

2.1.3 Priming the Pump and Associated Checks

Pumps and suction line must be vented prior to start-up and filled with the product pumped. The shut-off valve in the suction line must be fully open.

Fully open all auxiliary conncections and check the flow. Open shut-off valve in the vacuum balance line (if fitted) and close vacuum-tight shut-off valve E (Fig. 9).

Open minimum flow line of the non-return valve (if fitted). **Secure minimum flow line against accidental closing.**

Non-return valve with hand-operated line, open valve of this line. If the pump is fitted with a hand-operated minimum flow line (by-pass) only, open this line. If a check valve is fitted and start-up is to be effected with shut-off valve open, the check valve must be closed under the counter-pressure (e.g. boiler pressure). If prior to start-up there is no sufficient counter-pressure, start-up with closed shutt-off valve only.

2.2 Start-up

Start the set up only if the shut-off valve in the discharge line is closed. Slowly open the shut-off valve to obtain the required duty point after the pump has reached full speed.

N.B.

After the pump has reached its working temprature and / or if the pump leaks, tighten the tiebolts with the set disconnected.

2.3 Shutdown

Close the shut-off valve in the discharge line.

If a backstop is installed in the piping, the shut-off valve can remain open as long as there is a counter-pressure.

Switch off the motor, making sure the pumpset runs smoothly and evenly down to a standstill.

If the pumpset is to remain out of service for long periods, close the shut-off valve in the suction line. Close off the auxiliary connections.

On pumps supplied with product under vacuum, sealing liquid must be supplied to the stuffing box even during standstill. If there is a danger of **freezing** and / or if the pump is to be out of service for long periods, drain the pump or otherwise protect against freezing.

3 Maintenance and Lubrication

3.1 Supervision of Operation

The pump must run quietly and evenly at all times.

Max. permissible room temperature 40 °C.

The bearing temperature may exceed the room temperature by up to 50°C, but must not rise above 90°C (measured externally on the bearing housing).

⚠ Never allow the pump to run dry.

Do not run the pump against a closed shut-off valve for a prolonged period.

If the pump has gland packing this should leak slightly during operation. The gland cover should only be lightly tightened.

If the pump has a mechanical seal this experiences only minor leakage or no visible leakage (vapour) during operation. It is maintenance-free.

In case of prolonged periods of standstill, the pump should be started up and then shut down immediately, to ensure it is in constant readiness for operation.

– Fire fighting water	1 start-up/shutdown/month
– Drinking water	1 start-up/shutdown/48 hrs
– Standby pumps	1 start-up/shutdown/week

Check proper function of the auxiliary connections.

The flexible coupling elements should be regularly checked and replaced as soon as they show signs of wear.

3.2 Lubrication an Grease / Oil Change

3.2.1 Lubrication

The anti-friction bearings are lubricated by means of mineral oil. For required quantities see 4.2.2.4.

3.2.2 Oil Change

Grade HD 20

First oil change after 300 operating hours, all further changes every 3000 operating hours.

Procedure:

Remove threaded plug below bearing housing 350.1 and drain oil after draining of the bearing housing screw in the plug again and fill in oil as described under 2. 1. 1.

4 Special Instructions and Information

4.1 Basic Instructions / Information

⚠ Before dismantling, make sure the pump is disconnected from the power supply and cannot be switched on accidentally. The suction and discharge shut - off valves must be closed. Ensure that the pump casing has cooled down to ambient temperature and that it is empty and not under pressure.

4.2 Dismantling

1. Drain oil as described under 3.2.3. if oil lubrication is provided.
2. Dismantle auxiliary connections.
3. Remove coupling guard.
4. If coupling is not fitted with intermediate sleeve:Disconnect pump from motor and detach from baseplate.
5. If coupling is fitted with intermediate sleeve:For work on the shaft seals, bearings or shaft protecting sleeves or shaft sleeves respectively, the pump may remain on the basplate and connected to the pipeline.

If the pump has been in operation for a long time it may be difficult to remove certain parts from the shaft. If this is the case use a brand name penetrating oil or suitable pull - off device.

Never use force!

4.2.1 Shaft seal

The discharge side gland packing 461 with stuffing box housing 451 /discharge side mechanical seal 433 with stuffing box housing can be withdrawn after the circlip 932.1 (cooling cover 165) has been removed.

4.2.1.1 Gland Packing

Remove hex. nut 920.2, gland cover 452, gland packing 461, gland ring 457.1

4.2.1.2 Mechanical Seal

Remove seal cover 471.1 together with O-ring 412.8, circlip 932.1, shaft sleeve 523.1 with mechanical seal 433 (cooling cover 165).

4.2.2 Bearings

4.2.2.1. Stationary Bearing (pump side)

Deep Groove Ball Bearing

Remove hex. head bolt 901.1, bearing end cover 361.1, spacer disc 551, hex. head bolt 901.2, sleeve 520, hex. nut 920.1. Press bearing housing 350.1 off discharge casing 107. With - draw deep groove ball bearing 321, spacer disc 551. 1, gasket 411. 4. Remove O - ring 412.3

Angular Contact Ball Bearing

Remove hex. head bolt 901.1, end bearing cover 361.2 spacer disc 551.1, hex head bolt 901.2, hex. nut 920.1. Press bearing casing 350.2 off discharge casing 107 and withdraw with centering sleeve 526 angular contact ball bearing 320, sparcer disc 551.1, spacer ring 504.1, gasket 411.3.

4.2.2.2 Movable Bearing (motor side)

Withdraw coupling half using a pull-off device.

Remove (gasket 411.4), hex, head bolt 901.1, bearing cover 360, spacer disc 551.2, loosen clamping sleeve 531, hex. nut 920.1. Withdraw bearing housing 350.1 with cylindrical roller bearing 322 and clamping sleeve 531 from suction casing 106. Remove gasket 411.4.

4.2.2.3 Bearing Sizes

WKF	Stationary Bearings		Movable Bearings	
	Deep groove ball bearing DIN 625	Angular contact ball bearing DIN 628	Cylindrical roller bearings with clamping sleeve DIN 5412	DIN 5415
100	6405 C3	7307 BUA	NU 208 K C3	H 208

4.2.2.4 Lubrication Quantities

WKF		Code	Oil lubrication Oil per bearing ~ l
100	Stationary bearing	6405 C3 7307 BUA	0,25 0,30
	Movable bearing	NU 208 K C3	0,25

4.2.3 Balancing Device

Remove stuffing box housing 451, throttling bush 542 with O-ring 412.5, keywayed nut 920.4, throttle sleeve 522.

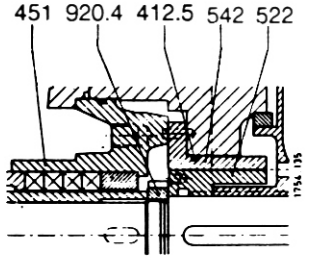


Fig. 11

4.2.4 Pump Body

Proceed dismantling the pump from the discharge side.

Slacken hex. nuts 920.3 allowing a slight pretension to remain. Loosen pump feet attachment screws.

Lift pump off the baseplat.

⚠ Do **not** handle with ropes attached to the pump shaft.

Fully lossen hex. nuts 920.3. Remove disc 550.1, withdraw tiebolts 905.

⚠ Place wedge or frame under stage casing 108.1 so as to allow free access to the parts to be dismantled.
Prior to dismantling position the stage casing 108.1 against each other and number consecutivly to ensure when assembling suction casing 106, stage casing 108.1 and discharge casing 107 are fitted again in the same order and position.

Remove discharge casing 107 casing wear ring 502.2 O-ring 412.2 and diffuser 171.3 at the same time; if not yet dismantled, withdraw circlip 932.1 and shaft protecting sleeve 524.1 (shaft sleeve 523.1, hex. nut 920.4, spacer sleeve 525.2). Dismantle in the following order: stage casing 108.1, O-ring 412.1, casing wear ring 502.1/2, diffuser 171.1/2, impeller 230.1/2.

Store stage casing in such a way that damage to the sealing faces is avoided.

4.2.5 Shaft

Check for true running on turning lathe.
Max. admssible out-of-truth tolerance 0,03 mm.
Re-conditioning of shaft 210 not allowed!

4.2.6 Rotor Clearance

		New Cast iron Bronze mm im ∅	max. admissible Cast iron Bronze mm im ∅
Casing wear ring/ impeller neck		0,30	0,80
Diffuser / impeller			
Throttle sleeve / throttling bush			
Shaft / suction casing	Suction lift operation		2,00
	Suction operation		0,80

4.2.7 Pump Rotor

⚠ Mount impeller 230.1/.2 (keywayed nut 920.4, spacer sleeve 525.2 or throttle sleeve 522), shaft protecting sleeve 524.1 / shaft sleeve 523.1, circlip 932.1 and pump side coupling half onto shaft 210.

4.3 Assembly

4.3.1 Pump

Reassemble in accordance with standard engineering practice. Coat fits and screw connections with graphite or similar prior to assembly.

Check the O-rings for wear and replace if necessary.

Assemble the pump in reverse order to dismantling and ensure the components are fitted in the correct sequence. When mounting new parts align pump rotor in the casing center with respect to the existing axial clearance. For this purpose displace the rotor - the pump being assembled but the (discharge side) stationary bearing dismantled -, first to the suction side then to the discharge side to its stop and take the axial measurement. From both measurements obtain the center position and fix with adquate number of spacer discs 551.1 (see complete drawing page 10).

4.3.2 Shaft Seal

4.3.2.1 Stuffing Box Compartment

Throughly clean the packing compartment and shaft protecting sleeve before packing the gland.

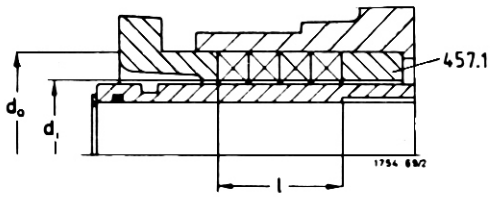


Fig. 12 Stuffing box compartment

mm

	100		
	d_i	d_a	l
Packing compartment	48	68	60
No. of rings	4 packing rings 1 gland ring		

4.3.2.2 Packing Ring of White Asbestos

Fig. 14 Packing ring cut to size

Packing required on each side:

WKF			100
Cord size	s	mm	10 □
Cord length	l	mm	≈ 760

Insert gland ring / lantern ring and first packing ring and push it home using the gland.

Fit each subsequent ring separately with its joint offset by 90° to the preceding one pushing it home with the gland cover. Tighten the gland cover slightly and uniformly. It must be possible to rotate the rotor without difficulty.

4.3.2.3 Packing Ring of Aramid

Before cutting the packing cord wrap the cut faces with PTFE (polytetraflourethylene) tape and cut in vertical direction to the longitudinal axis of the cord. The PTFE tape may not be removed from the cut faces again.

Cord length per packing ring mm:

Length of ring RL = $(d_a - 0,5 \times s) \times 3,14 \times 1,05$

Insert gland ring as well as the first packing ring with cut face, press **straight** inwards and tighten slightly only. Fit each subsequent packing ring with its joint offset by approx. 90° to the preceding one, pushing it home with the gland cover. Tighten the gland cover **by hand** and subsequently loosen by $^1/_2$ turn. Use thickness gauge to check unifrom seat of the gland cover under pressure. Set leakage during approx. 30 minutes while the pump is operating.

Leakage value: ≈ 2-2,5 l/h

If the leakage value is too low, the nuts at the gland cover must be loosened.

4.3.2.4 Stuffing Box Cooling

Use cleaned cooling water without the tendency to precipitate hardners and allow it to drain freely. Difference in temperature between inlet and outlet ≈ 15° C. Max. admissible outlet temperature 80° C. Pressure up to 10 bar.

Water cooling from external source with medium handled > 140 °C.

Cooling water required per shaft seal see Fig. 15.

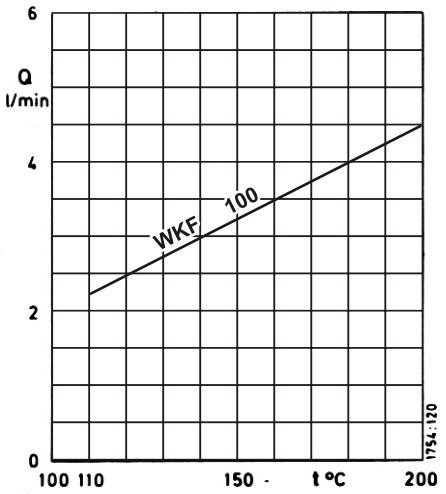


Fig. 15 Cooling water required for jacket cooling.

4.3.2.5. Mechanical Seal

Reassemble in the revers order to dismantling.
When fitting the mechanical seal, bear the following in mind:
Utmost care and utmost cleanliness are mandatory.
Do not remove the guard on the seal faces until just before fitting.
The seal faces and O-rings must not be damaged.
Clean or carefully remove any deposits from the seat and the stationary seal ring seat in the bearng housing.

The shaft sleeve 523.1 may be wetted with water to reduce friction when mounting the seal.

EPDM rubber O-rings must not come into contact with oil or grease. Use water.

Push the stationary seal ring into the sealing plate by hand or use fingers applying pressure evenly to all sides.

When handling medium > 140 °C. cooling of circulation liquid by means of heat exchanger and additional jacket cooling.

For cooling water required for **both heat exchangers** see Fig. 16.

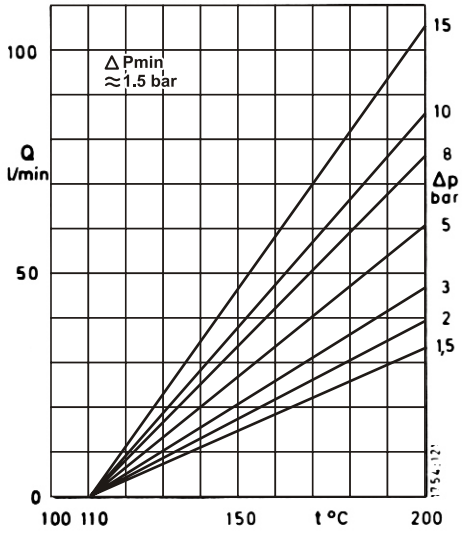


Fig.16 Cooling water required for both heat exchangers

4.4 Tightening Torques for the Tie bolts

Material	WKF 100
	Torque Nm
St 42 K	250

4.5 Switching Frequency

Reference value: max. 30 switchings/h

4.6 Speeds

Max. admissible speed n = 1/min

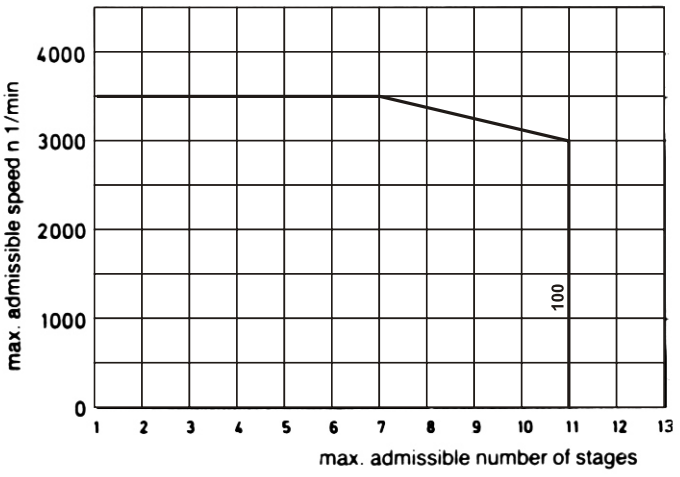
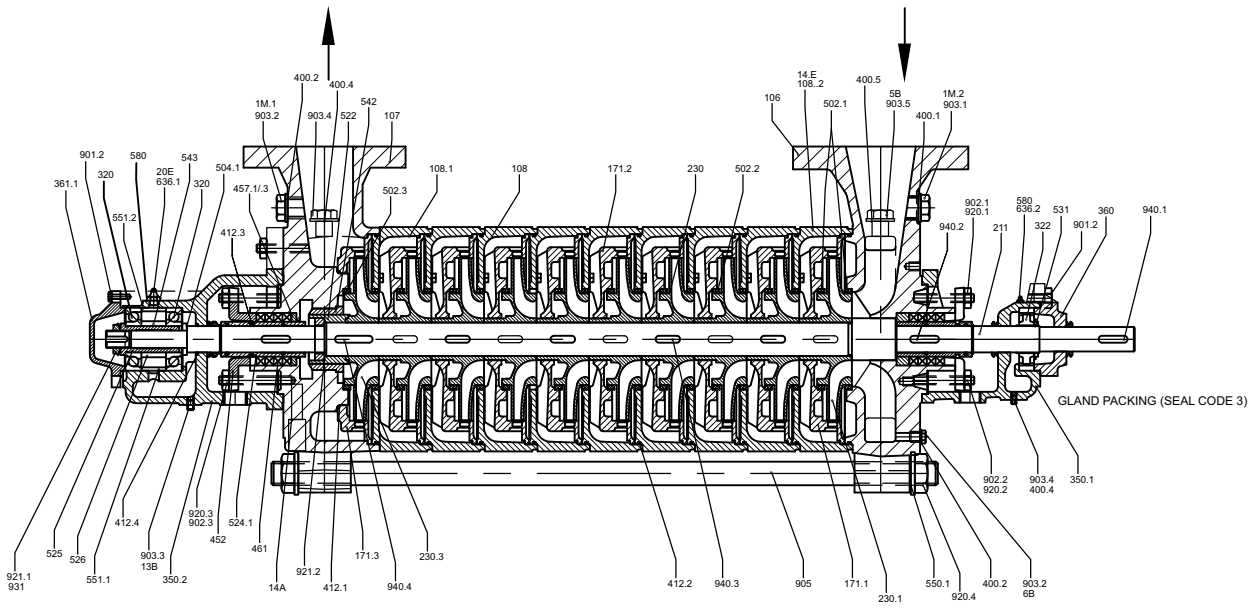
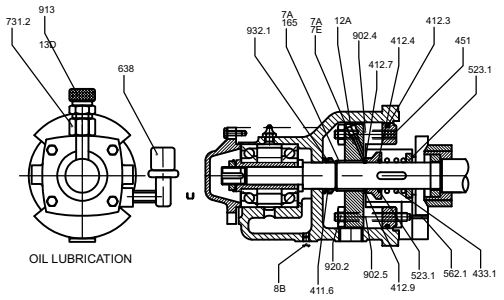
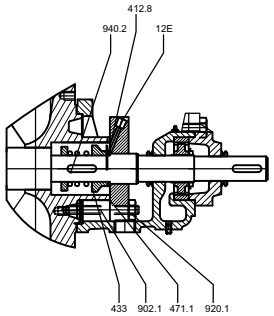


Fig 17 Max. admissible speed

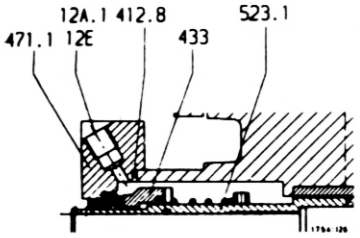
General Drawing and List of Components



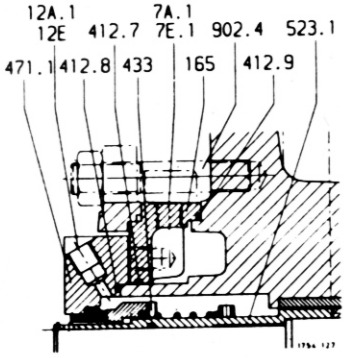




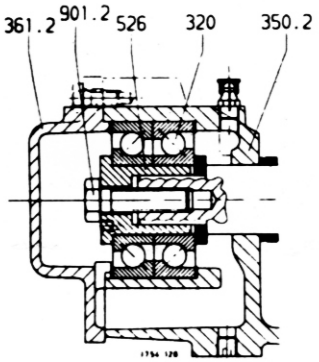
PART LIST					
PART NO.	**DESCRIPTION**	**PART NO.**	**DESCRIPTION**	**PART NO.**	**DESCRIPTION**
106	Suction Casing	452	Stuffing Box Gland	902.1/.2/.3.4	Stud
107	Discharge Casing	457.1	Gland Ring	903.1/.2/.3	Threaded Plug
108.1/.2	Stage Casing	461	Gland Packing	905	Tiebolt
165	Cooling Cover	471.1	Seal Cover	920.1/.2/.3/.4	Hex. Nut
171.1/.2/.3	Diffuser	502.1/.2	Casing wear ring	921	Lock Nut
211	Shaft	520	Sleeve	931	Lock washer
230.1/.2	Impeller	523.1	Shaft Sleeve	932.1	Circlip
320	Angular Contact ball Bearing	524.1	Shaft Protecting Sleeve	940.1/.2/.3/.4	Fitting Key
321	Deep Groove Ball Bearing	525	Spacer Sleeve	1 M.1/.2	Conection for pressure gauge
322	Cylindrical roller bearing	526	Centering Sleeve	5 B	Air escape
350.1/.2	Bearing Housing	531	Clamping Sleeve	6 B	Product drain
360	Bearing Cover	543	Spacer Bush	7 A.1	Cooling liquid outlet
361.1/.2	Bearing End Cover	550.1	Washer	7 E.1	Cooling liquid inlet
400.1/.2/.3/.4	Gasket	551.1/.2	Spacer Disc	8 B	Leakage liquid drain
411.6	V-Ring	562.1	Cylindrical Pin	12 A.1/.2	Circulation liquid outlet
412.1/.2/.3/.4	O.Ring	580	Nipple Cap	12 E	Circulation liquid inlet
412.7/.8/.9	O.Ring	636.1/.2	Grease nipple	14 A	Balance liquid outlet
433	Mechanical Seal	903.3	Threaded Plug		
451	Stuffing Box Housing	901.1/.2	Hex. Head Bolt		



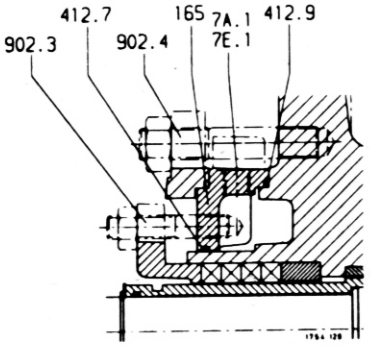
Mechanical seal, reference code 4, 5



Mechanical seal, reference code 6



Angular contact ball bearing, paired



Gland packing, reference code 3

4.8 List of components

Part No.	Part designation
106	Suction casing
107	Discharge casing
108.1	Stage casing
165	Cooling cover
171.1-.3	Diffuser
210	Shaft
230.1/.2	Impeller
320	Angular contact ball bearing
321	Deep groove ball bearing
322	Cylindrical roller bearing
350.1/.2	Bearing housing
360	Bearing cover
361.1/.2	Bearing end cover
411.1-.3	Gasket
411.4	Gasket
412.1-.4	O-ring
.7-.9	O-ring
433	Mechanical seal
451	Stuffing box casing
452	Gland cover
457.1	Gland ring
461	Gland packing
471.1	Seal cover
502.1/.2	Casing wear ring
520	Sleeve
523.1	Shaft sleeve
524.1	Shaft protecting sleeve
525.2	Spacer sleeve
526	Centering sleeve
531	Clamping sleeve
550.1	Disc
551.1/.2	Spacer disc
562.1	Cylindrical pin
580	Cap
636	Grease nipple
731.1	Plug
901.1/.2	Hex. head bolt
902.1-.4	Stud
903.1-.3	Threaded plug
905	Tiebolt
920.1-.4	Hex. nut
932.1	Circlip
940.1-.4	Key
1 M.1/.2	Connection for pressure gauge
5 B	Air escape
6 B	Product drain
7 A.1	Cooling liquid outlet
7 E.1	Cooling liquid inlet
8 B	Leakage liquid drain
12 A.1/.2	Circulation liquid outlet
12 E	Circulation liquid inlet
14 A	Balance liquid outlet

5 Faults/Causes-Remedies

Pump delivers insufficient liquid	Motor overloaded	Pump does not deliver	Bearing overheating	Pump leaks	Excessive shaft seal leakage	Pump runs noisily and roughly	Excessive temperature increase in the pump	Cause	*Remedy*[1)]
●		●					●	Pump generates an excessively high differential pressure	*Re-set the duty point* *Check installation for contamination* *Fit larger impeller(s)*[2)] *Increase speed (of turbine or combustion engine)*
●		●				●	●	Pump and / or piping inadequately vented or primed	*Vent or prime*
●		●						Suction line or impeller(s) clogged	*Remove deposits in the pump and / or piping*
●		●						Formation of air pockets in the piping	*Alter the piping layout* *Fit a vent valve*
●		●			●	●	●	Suction head too high / $NPSH\text{-}_{plant}$ is too low	*Correct the liquid level* *Fully open the suction side shut-off valve* *Modify the suction line if the piping losses are excessive* *Check the suction strainers/suction aperture* *Ensure that the permissible rate of pressure decrease is not exceeded*
●		●						Ingress of air at the shaft seal	*Clean out the sealing liquid passage, possibly introduce an external source sealing liquid or increase the pressure* *Fit a new shaft seal.*
●		●			●			Reverse rotation	*Change over two phases of the power supply*
●		●						Speed too low[2)]	*Increase the speed*
●	●		●			●		Excessive wear to pump internals	*Replace the worn components*
	●					●		Pump back pressure is lower than specified in order	*Re-set the duty point correctly*
●	●							Specific gravity or viscosity of the product pumped is higher than specified in the order	[2)]
	●				●		●	Gland cover is too tight or tightened askew	*Rectify, allow larger leakage quantity*
	●							Speed too high	*Reduce the speed*[2)]
				●				Tiebolts / gaskets	*Tighten up the tiebolts* *Fit new gaskets*
					●			Worn shaft seal	*Fit a new shaft seal* *Check the pressure of the flushing / sealing liquid*
					●			Surface of the shaft protecting sleeve/shaft sleeve is scored or rough	*Fit a new shaft protecting sleeve / shaft sleeve* *Fit a new shaft seal*

Pump delivers insufficient liquid	Motor overloaded	Pump does not deliver	Bearing overheating	Pump leaks	Excessive shaft seal leakage	Pump runs noisily and roughly	Excessive temperature increase in the pump	Cause	*Remedy*[1]
					●			Uneven running of pump	*Rectify the suction conditions* *Re-align the pump* *Rebalance the rotor* *Increase the pressure at the suction nozzle*
			●		●	●		Pumpset misaligned	Re-align
			●		●	●		The pump is warped or there are resonance vibrations in the piping	*Check the piping connections and the pump holding bolts, if necessary, reduce the gap between the pipe clamps* *Fix pipings over vibration absorbing material*
			●					Excessive axial thrust [2]	*Clean out the balance holes in the impeller* *Check impeller tolerances and axial impeller adjustment*
			●			●		Excessive, insufficient or unsuitable lubricant	*Reduce or increase the lubricant quantity or change the lubricant*
			●					Specified coupling gap not respected	*Correct the coupling gap as per the installation plan*
●	●							Motor runs on two phases	*Replace the defective fuse* *Check the electrical connections*
			●		●	●		Rotor unbalanced	*Rebalance the rotor*
			●		●	●		Bearings defective	*Fit new bearings*
			●			●	●	Inadequate flow	*Increase the minimum flow*
					●			Faults in the circulation liquid supply	*Increase the cross-section of the line supply*
●	●	●				●		Non-reflux valve defective or not fitted for operation in parallel	*Check*
					●			Stuffing box packed incorrectly, wrong packing material	*Check*
			●		●		●	Stuffing box space cooling defective	*Check cross-section of cooling liquid supply*
●			●		●			Change in the cross section of the balance liquid recirculating line wear in the balancing device	*Check balance line* *Check clearance at shaft in the discharge casing*

1) The pump should be made pressureless before attempting to remedy faults in parts under pressure
2) Please contact KSB

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SALES OFFICES: UAN: 111 572 786
You can also contact on the following addresses for assistance:

- **Lahore:** Gardee Trust Building, Napier Road, Lahore. **Tel:** 042-7355238-7311661 **Fax:** 042-7236922 **E-mail:** ksblhr@ksbpak.com
- **Rawalpindi:** 309-A-3 Peshawar Road Westridge 1, Opposite Valley Clinic Rawalpindi.
  Tel: 051-5478196-7 **Fax:** 051-5472612 **E-mail:** ksbrwp@ksbpak.com
- **Karachi:** 501, 5th Floor, Fiayaz Centre 3-A, Sindhi Muslim Co-Operative Housing Society, Opp. FTC Building, Shahrah-e-Faisal, Karachi.
  Tel: 021-4388306-9 **Fax:** 021-4388302 **E-mail:** ksbkhi@ksbpak.com
- **Multan:** 85-A, Qasim Road, Opp. Metro Plaza, Multan Cantt. **Tel:** 061-4541983-4 **Fax:** 061-4541784 **E-mail:** ksbmul@ksbpak.com
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